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EXAMINER	
HUISMAN, DAVID J	

ART UNIT	PAPER NUMBER
2183	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/577,022	WEIBERLE ET AL.	
	Examiner	Art Unit	
	DAVID J. HUISMAN	2183	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 April 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/24/06, 2/22/08, & 2/12/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 25-47 have been examined.

Papers Submitted

2. It is hereby acknowledged that the following papers have been received and placed of record in the file: Certified Copy of Foreign priority Application, IDS, and Preliminary Amendment as received on 4/24/2006, Oath/Declaration as received on 4/9/2007, Preliminary Amendment as received on 11/26/2007, and IDS as received on 2/22/2008.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

4. The abstract of the disclosure is objected to because of the following:

- The abstract begins with a sentence fragment. Please replace the fragment with an actual sentence.
- Please refer to high performance and high reliability modes, so that the abstract is more descriptive.

Correction is required. See MPEP § 608.01(b).

Drawings

5. The drawings are objected to for being informal in nature. Please submit new drawings with clear (not hand-drawn) components and reference numbers/letters. Also, please label boxes 17, 110, 210, 302, 303, 303A, 304, 305C, 306, 306A, 307, and 502.

Claim Objections

6. Claim 25 is objected to because of the following informalities: In line 3, replace "executing" with --execution--. Appropriate correction is required.

7. Claim 26 is objected to because of the following informalities: For increase clarity, applicant should insert --in the first operating mode-- at the beginning of line 2. Appropriate correction is required.

8. Regarding claims 31 and 43, should "derived from the operands" be replaced with --derived from the one of the operands--? Clarification is requested.

9. Claim 39 is objected to because of the following informalities: In line 3, insert --the at least one-- before "operand register". Appropriate correction is required.

10. Claim 47 is objected to because of the following informalities: In line 4, replace "for triggers" with either--that triggers-- or --for triggering--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 25-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13. First, applicant's use of "clock cycle" throughout the claims is unclear. It is not clear if applicant means to use "clock cycle", "clock speed", "clock rate", or something else. For instance, in claim 40, the use of "cycle" in this context doesn't appear to be correct. Though, the use of cycle is mentioned below for some claims, the examiner asserts that the use of "cycle" doesn't appear to be proper in any of the claims that include it. The examiner would like clarification from applicant. Recall that no new matter will be permitted.

14. Regarding claims 25 and 35, the intended scope of "operating the executing units at a predefinable clock cycle" is unclear. A cycle encompasses the activity between two rising edges (or two falling edges). That is, a single cycle comprises a transition of the clock signal from low to high and a second transition from high to low (or vice-versa). Is applicant claiming that the execution units are to operate in one particular, known cycle? Or does applicant mean to claim that the units operate at a predefined clock speed/rate? Clarification is requested.

15. Regarding claim 26, it is not clear what is "in the form of a full cycle". Clarification is requested.

16. Regarding claims 27 and 36, the grammar of the claim is simply unclear. Specifically, it is not clear what is meant by "as full cycle". Also, it is not clear what is meant by "the clock cycle of the execution units". Clarification is requested.

17. Regarding claim 28, it is not clear what is meant by "designed as half cycle". Clarification is requested.

18. Claim 32 recites the limitation "the individual operating mode" in the last line. There is insufficient antecedent basis for this limitation in the claim.

19. Regarding claim 34, it is not clear what is released simultaneously or successively. That is, if one of state and results are released, what are they released simultaneously or successively with? Clarification is requested.

20. Claim 35 recites the limitations:

- "the operands" in lines 4-5 and in the last two paragraphs of the claim. There is insufficient antecedent basis for this limitation in the claim because does not set forth multiple operands.
- "both execution units" in multiple locations throughout the claim. There is insufficient antecedent basis for this limitation in the claim because there are at least two execution units. Hence, when there are 3 or more units, applicant cannot refer to "both".

21. Claim 39 is unclear because it is not understood what is meant by "wherein the feed units as register system". Clarification is requested.

22. Claim 47 recites the limitations:

- "the operands" in lines 4-5 and in the last two paragraphs of the claim. There is insufficient antecedent basis for this limitation in the claim because does not set forth multiple operands.
- "both execution units" in multiple locations throughout the claim. There is insufficient antecedent basis for this limitation in the claim because there are at

least two execution units. Hence, when there are 3 or more units, applicant cannot refer to "both".

23. Claims 26-34 and 36-46 are rejected under 35 U.S.C. 112, 2nd paragraph, for being indefinite, because they are each dependent on an indefinite claim.

Claim Rejections - 35 USC § 102

24. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

25. Claims 25, 29-35, 37-40, and 42-47 are rejected under 35 U.S.C. 102(e) as being anticipated by Grochowski et al., U.S. Patent No. 6,615,366 (herein referred to as Grochowski).

26. Referring to claim 25, Grochowski has taught a method for processing operands in a processing unit having at least two execution units (Fig.1, components 110(a)-(b)), comprising:

a) operating the executing units at a predefinable clock cycle. This is deemed inherent as all components in a processor are operated with respect to a clock and its cycles.

b) triggering the execution units by control signals for a processing of the operands. This is deemed inherent as execution units are inherently triggered by control signals produced in response to receiving an instruction.

c) switching between a first operating mode and a second operating mode. See column 2, lines 27-30.

d) in the first operating mode, supplying the execution units with the same operands. See column 2, lines 32-34.

e) in the second operating mode, supplying the execution units with different operands. See column 2, lines 34-36.

f) wherein the execution units are triggered by the same control signals for the processing of the operands in the first operating mode, and the execution units are controlled by different control signals for the processing of the operands in the second operating mode. See column 2, lines 32-36. If two units are executing the same instruction in lockstep, then they are being controlled identically (using the same control signals). If two units are executing different instructions, then they are being controlled differently (using different control signals).

27. Referring to claim 29, Grochowski has taught the method as recited in claim 25, wherein the execution units process the operands in synchrony in the first operating mode and the second operating mode. This is deemed inherent as both execution units will process in synchrony with the clock, and hence with each other, in either mode.

28. Referring to claim 30, Grochowski has taught he method as recited in claim 25, further comprising:

a) processing the operands in synchrony in the first operating mode. See column 2, lines 32-34. Lockstep implies synchronous execution.

b) processing the operands in asynchrony in the second operating mode. See Fig.4B, and note that the pipeline states may not be synchronized during the second mode (i.e., one unit's stages may be operating while the other's are not).

29. Referring to claim 31, Grochowski has taught the method as recited in claim 25, further comprising: comparing one of the operands and data derived from the operands for agreement and detecting an error in case of a deviation. See column 12, line 62, to column 13, line 8.

30. Referring to claim 32, Grochowski has taught the method as recited in claim 25, further comprising: comparing one of states and results produced in the processing of the operands for agreement and detecting an error in a deviation, the comparison being implementable as a function of the individual operating mode. See column 4, lines 16-19, and note that the comparison is a function of the HR mode.

31. Referring to claim 33, Grochowski has taught the method as recited in claim 32, further comprising: releasing the one of the states and the results by a release signal as a function of the operating mode and the comparison. See Fig.2C, and note that if there is no error signal produced in the HR mode by the comparator, then the result is valid, and it is released.

32. Referring to claim 34, Grochowski has taught the method as recited in claim 32, further comprising: releasing the one of the states and results by a release signal one of simultaneously and successively as a function of the operating mode. See Fig.2C, and note that if there is no error signal produced in the HR mode by the comparator, then the result is valid, and it is released. Note that the releasing can only either happen simultaneously or successively (there are no other options), and so one of these is inherent within Grochowski.

33. Referring to claims 35, 38, and 43-46, the devices of claims 35, 38, and 43-46 perform the methods of claims 25, 30-32, 25, and 25, respectively. Consequently, claims 35, 38, and 43-46, are rejected for the same reasons set forth in the rejections of claims 25, 30-32, 25, and 25, respectively.

34. Referring to claim 37, Grochowski has taught the device as recited in claim 35, wherein the execution units are embodied as at least one of arithmetic logic units, floating point units, processors, and a coprocessor. See Figs.1-2A, components 110(a) and 110(b). These components are processors (cores).

35. Referring to claim 39, Grochowski has taught the device as recited in claim 35, wherein the feed units as register system are designed such that at least one operand register is provided and at least one buffer register is provided between operand register and each execution unit. That is, Fig.2A shows a pipeline in which the register stage and execution stage are separate. The examiner asserts that it is inherent in a pipeline to include edge-triggered latches/buffers between each stage. Using said buffers allows each stage to work on only one set of data each clock cycle. Hence, when data from an operand register in stage 230 is to be sent to the execution unit, it must first be sent to a buffer register.

36. Referring to claim 40, Grochowski has taught the device as recited in claim 35, wherein the feed units and the execution units are designed such that they operate at different clock cycles in the second operating mode. See Fig.2A. Regardless of mode, the register stage always operates one cycle before the execution stage for a particular instruction. Hence, the feed unit (register files) and execution units operate at different clock cycles (1 cycle apart).

37. Referring to claim 42, Grochowski has taught the device as recited in claim 35, further comprising: a decoder by which a switchover condition is detectable, wherein the decoder operates at the same clock cycle as the feed units. See column 2, lines 39-44. Note that a mode switch is encountered, and this is inherently detected by the decoder. Also, not from Fig.2A that the decoder in stage 220 and the register file in stage 230 operate at the same clock cycle. This is

deemed inherent due to the nature of a pipeline. In a pipeline, all stages operate in the same cycle on different data. Hence, any two stages operate at the same cycle.

38. Referring to claim 47, the device of claim 47 performs the method of claim 1. Consequently, claim 47 is rejected for the same reasons set forth in the rejection of claim 1.

Claim Rejections - 35 USC § 103

39. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

40. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Grochowski in view of Sager et al., U.S. Patent No. 5,828,868 (herein referred to as Sager).

41. Referring to claim 43, Grochowski has taught the device as recited in claim 35. Grochowski has not taught that the feed units are designed such that in the second operating mode they operate at a clock cycle that is twice as fast as that of the execution units. However, Sager has taught the concept of running different components at different frequencies, and specifically, a register file operating at frequency 2X, where X is the operating frequency of execution units. Sager has taught that the reason for doubling the frequency, is so that half of the read ports could be reduced, thereby reducing hardware and die space required. As a result, in order to decrease the amount of hardware used in the implementation, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Grochowski such

that the feed units are designed such that in the second operating mode they operate at a clock cycle that is twice as fast as that of the execution units.

Conclusion

42. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is reminded that in amending in response to a rejection of claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by the references cited and the objections made. Applicant must also show how the amendments avoid such references and objections. See 37 CFR § 1.111(c).

Quach, U.S. Patent No. 6,640,313, has taught a high-reliability operating mode.

Nguyen et al., U.S. Patent No. 7,055,060, has taught executing in high-reliability and performance modes.

Safford et al., U.S. Patent No. 7,287,185, has taught selective use of a high-reliability mode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID J. HUISMAN whose telephone number is (571)272-4168. The examiner can normally be reached on Monday-Friday (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David J. Huisman/
Primary Examiner, Art Unit 2183